DOCUMENT RESUME

ED 394 825 SE 058 295

AUTHOR Hektner, Joel M.
TITLE Sex-Stereotyping of Mathematics and English at Three Developmental Periods: Students' Attitudes Toward Peers.
PUB DATE Oct 95
NOTE 37p.; Paper presented at the Annual Meeting of the Mid-Western Educational Research Association (Chicago, IL, October, 1995).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Elementary Secondary Education; Grade 5; Grade 8; Grade 11; *Language Arts; *Mathematics; *Peer Influence; Questionnaires; Sex Differences; *Sex Stereotypes; *Student Attitudes; *Students

ABSTRACT

The purpose of this study was to examine the potential role of peer influences in contributing to the relative underachievement of girls in mathematics. Upper middle class, suburban New Jersey students (n=172 in grades 5, 8, and 11) were asked to express their attitudes toward hypothetical peers displaying strong interests and abilities in mathematics or English. Participants indicated that students fitting the gender stereotype (males good in mathematics and females good in English) would be better liked by same-sex peers than non-stereotypical students. Eighth graders and males consistently favored stereotypical students on several measures. English-oriented students were given more positive ratings than math-oriented students; this distinction increased with grade. The overall results showed that English is considered nearly gender-neutral; but mathematics is a male-stereotyped domain. (Author/MKR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 394 825

Sex-Stereotyping of Mathematics and English at Three Developmental Periods: Students' Attitudes Toward Peers

Joel M. Hektner

University of Chicago

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

J.M. Hektner

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

Paper presented at the Annual Meeting of the Mid-Western Educational Research Association, October, 1995, Chicago. I am indebted to Gita Z. Wilder, of Educational Testing Service, for her helpful suggestions and comments on this work. Correspondence may be addressed to the author at OSC/NORC, 1155 E. 60th St., Chicago, IL 60637, or to aaijoelh@cicero.spc.uchicago.edu.

SP035916

Abstract

The purpose of this study was to examine the potential role of peer influences in contributing to the relative underachievement of girls in mathematics. Students (N = 172) in the fifth, eighth, and eleventh grades in two suburban New Jersey school districts were asked to express their attitudes toward hypothetical peers displaying strong interests and abilities in math or English. Participants indicated that students fitting the gender stereotype (males good in math and females good in English) would be better liked by same-sex peers than non-stereotypical students (males in English and females in math). Eighth graders and males consistently favored stereotypical students on several other measures as well. English-oriented students were given more positive ratings than math-oriented students; this distinction increased with grade. The overall results show that English is considered nearly gender-neutral, but math is a male-stereotyped domain. It is suggested that the negative attitudes adolescents hold toward math-oriented girls may steer these girls away from developing their talents in math.

Is it socially acceptable, in the social world of a child, for a girl to excel in mathematics? This is the central question addressed by this study; the objective is to test peer attitudes as one of the possible links between the gender-stereotyping of mathematics and the underachievement of girls in math. If children and adolescents hold the stereotypical belief that math is a male domain, these beliefs are likely to be manifested in their attitudes and behaviors toward their female classmates who display the strongest interest and ability in math. Girls who perceive these attitudes of their peers and who desire social acceptance may thus avoid developing their talents in this field. Boys, on the other hand, would not have to reduce their efforts in math to earn social desirability. If this is the case, boys on the whole would learn more math than girls.

For several years, males as a group have outscored females on the mathematics portions of many national standardized tests, including the Scholastic Aptitude Test (Sadker, Sadker, & Steindam, 1989; Wainer & Steinberg, 1992). Meta-analyses of hundreds of studies have shown a consistent gender difference in mathematics performance favoring males, though the difference is small and decreasing (Friedman, 1989; Hyde, Fennema, & Lamon, 1990). The difference appears not as much in the early childhood years as in the late adolescent years. Sadker and Sadker (1986) pointed out that in the early elementary grades, girls score as high or higher than boys on standardized tests. Furthermore, several researchers have observed that girls consistently receive higher report card

grades, often even in math (Clifton, Perry, Parsonson, and Hryniuk, 1986; Ekstrom, 1994). In sum, "girls are the only group who enter school scoring ahead and 12 years later leave school scoring behind" (Sadker et al., 1989, p. 46).

Assuming the gender gap in standardized test scores reflects actual differences in acquired academic ability and aptitude, several explanations have been suggested for the discrepancy, including those based on biological sex differences and those focusing on the different social environments in which males and females participate from birth. While not denying the possibility of the former, this study takes the latter approach, suggesting that gender-role socialization may cause girls to gravitate away from the study of math and science. Parents, schools, and society in general may socialize girls to accept that such studies are not meant for them. Several researchers have concluded that environmental factors have influenced girls to participate less often than boys in courses and activities dealing with mathematics and science (Blackman, 1986; Visser, 1987). Thus, gender differences in test performance and in the abilities thereby implied may be attributable, at least in part, to differences in the amount of instruction males and females choose to receive (Pallas & Alexander, 1983).

Much evidence exists that contemporary American society does not expect females to study mathematics and science as rigorously as males are expected to. Researchers have found beliefs and behaviors perpetuating this stereotype from the level of mass

culture down to parent-child interaction. Pictures in popular computer magazines (Ware & Stuck, 1985), teacher practices (Borman & O'Reilly, 1987; Sadker & Sadker, 1986), and parental behaviors and expectations (Linn, 1985; Visser, 1987) all contribute to a social environment that is not inviting to girls interested in math.

Although much research has been conducted concerning the influential roles of parents and teachers in the education of a child, fewer studies have probed the specific effects that the child's peers have on his or her reception of that education. Many researchers have observed that peers are profoundly important in the development of children's beliefs, attitudes, and behaviors, especially in the later grades. Best (1983), for example, concluded that peers become the most important source of social feedback for children before the end of the elementary grades. However, one question that has not been widely probed is the degree to which children use their powerful influence on each other to reinforce social precepts such as academic gender roles.

For the female athlete, social desirability depends on the gender-appropriateness of her sport. Kane (1988) discovered that a female in tennis, golf, or volleyball would more likely be chosen by males and females as a date or friend, respectively, than one who played the traditionally more masculine sports of basketball or softball.

To determine if a student's academic interests also serve as a basis for peer judgements, one must first examine the attitudes

of children toward the different academic fields. Exposed to differential treatment at school and at home, generations of children have readily concluded that math and science, and the technologies that depend on these fields, are for boys (Eccles et al., 1983). More recent research by Tocci and Engelhard (1991) has shown that only boys still cling to this stereotype. Nelson and Cooper (1989) reported that children of both sexes believe that video games are a male domain. Only boys, however, see computers as more appropriate for their gender.

Although girls are relatively unwilling to categorize math in this way, their negative attitudes toward math indicate that they may still be allowing the stereotype to influence them. Randhawa (1994) and Tocci and Engelhard (1991) found that compared to boys, girls have more math anxiety and see it as less useful to society. High school girls also express more positive sentiments about English than boys do (McTeer, 1986; Sosniak & Ethington, 1988), and they see English as more important and interesting (Eccles, Adler, & Meece, 1984). Boys in these studies were more inclined than girls to favor mathematics.

Many of the female high school juniors interviewed by Sherman (1983) reported feelings of embarrassment because of their success in mathematics. Girls in Stipek and Gralinski's (1991) sample expressed less pride than boys in their success in math. Junior high boys, on the other hand, have shown more positive perceptions of the male peer group's attitude toward themselves as learners of math (Visser, 1987). Unsurprisingly, then, boys have generally

been more confident of their performance in math (Bornholt, Goodnow, & Cooney, 1994; Randhawa, 1994).

These findings suggest that adolescents' attitudes may extend beyond an academic field itself to concern their peers who display the most motivation or aptitude in the field. To assess the likelihood of this possibility, this study tests the hypothesis that students who do not conform to the stereotypical academic pattern for their gender are less socially desirable among their peers than students who do fit the stereotype. In other words, girls with high interest and ability in math are expected to be less socially accepted than more verbally-oriented girls and math-oriented boys. A further expectation warranted by previous research is that boys will be more likely to base their judgement of the social desirability of a peer on these factors than will girls.

Because several researchers have shown that children's attitudes regarding gender-appropriate activities change with age (for example, Carter & McCloskey, 1983-1984; Emmerich & Shepard, 1982; Katz & Boswell, 1986), the present study included children in three age groups: grades five, eight, and eleven. These grade levels were chosen to be representative of three developmental periods identified by Emmerich and Shepard as late childhood, early adolescence, and late adolescence.

Method

Sample

Students in the fifth and eighth grades in two upper middle class suburban school districts in central New Jersey participated in the study; high school juniors in one of the districts also took part. From the random sample, 172 who returned parental consent forms and who were in attendance on the day of the study were included. The grade distribution was as follows: 76 fifth graders, 75 eighth graders, and 21 eleventh graders. Ninety-four of the participants, or 55%, were female. Most of the participants were White.

Questionnaire

The questionnaire presented two short paragraphs, each describing a hypothetical "target" student. Each description was followed by eight questions about this target. Lastly, participants were asked to indicate their gender. This question was not asked first to avoid making gender the most salient issue in reading the target descriptions.

Descriptions of targets. For each grade level, four variations of a brief paragraph describing a hypothetical student in that grade at another school were developed. The four possible targets were a girl interested in math and computers, a girl interested in English and reading, and boys in each of these categories. Except for words denoting gender, the descriptions within each category were identical. Table 1 presents one of these descriptions. Each description of a target contains, like the

paragraph in Table 1, five points that contribute to the overall perception of the target as one for whom an academic category is very important. These points are:

(1) That math or English ("reading" for fifth graders) is the target's favorite subject.

(2) That the target does his or her best work in math or English.

(3) That the target does not do as well in the other subject.

(4) That the target spends time outside of class, as a hobby or extra-curricular activity, applying the knowledge of his or her "best" subject.

(5) That the target's future plans are based on an assumption of continued excellence and interest in that subject.

Questions about the targets. Participants were asked to express their estimations of the desirability or acceptability of their targets by circling a number on a seven-point rating scale in response to each of the eight questions listed in Table 1. Included were questions concerning the target's potential popularity, normality vs. weirdness, friendliness, and tendency to be a fun or boring person. For each question, "1" was labeled as the most negative response, carrying the label "No way" for many of the questions, while "7" was designated as the most positive answer.[1] Ambivalence or unwillingness to speculate was to be signified by circling "4", the midpoint of the scale.

---

[1]Before the study, target paragraphs and questions were pilot tested on a small group of students, who suggested minor changes in wording to improve the age-appropriateness and naturalness of expression. Their suggestions were implemented for the full study.

Target combinations. Each participant was presented with two targets to rate out of the four possible targets. These two targets differed in gender and academic subject. The questionnaires were counterbalanced for order, with each unique target appearing first in roughly one-quarter of the copies. As a result of this arrangement, each participant received a pair of targets that either conformed to traditional gender stereotypes (male-math and female-English, in either order) or did not (female-math and male-English, in either order).

Procedure

In each school, participating students left their classrooms and completed the questionnaires in a separate room, to lessen the salience of the particular subject they happened to be studying at the time. Questionnaires were distributed randomly. The students were not told of the study's objectives until after they had completed the questionnaires.[2]

Analyses. Pearson correlation coefficients were computed for each question in relation to every other question. All were significant ($p < .001$) and positive, ranging from .23 to .69. To obtain a measure of overall social acceptability, a composite variable named "acceptance score" was created by averaging the responses of the participant on the eight questions. This variable and the eight item responses were the dependent measures.

---

[2]Before beginning the questionnaire, fifth grade participants completed an example question to verify their understanding of the use of a seven point response scale.

The independent variables included participant characteristics (gender and grade) and target characteristics (gender and preferred academic subject).[1] To test for comparison effects, position of target in the participant's packet (appearing first or second) was also a factor. An ANOVA which included these factors was applied separately to acceptance score and to each of its components. The results of these analyses were not able to differentiate preferences which followed stereotypical lines from other trends (See results below). In order to control for these trends and to simplify the interpretation of complex interactions, a new "stereotypical status" variable was created. Male-math and female-English targets were designated "stereotypical"; the other two targets, "non-stereotypical". This distinction corresponded to the arrangement of targets in each survey packet, in which either the stereotypical or the non-stereotypical pair was presented. A second ANOVA was then applied to each of the dependent measures using stereotypical status as a factor instead of Target Gender and Target Type. For all analyses, an alpha of .05 was used.

Results

Preference for English-oriented Targets

Main effect. On every measure, participants rated targets who were best in English or reading higher than targets excelling in math; the difference in means reached significance in all but two

---

[1]A preliminary ANOVA yielded no significant effects of school district on any of the dependent measures. Thus, this variable was not included in further analyses.

items (See Table 2). The effect sizes (Cohen's *d*) of the significant differences range from .24 to .51, in the range Cohen (1992) terms a "small" to "medium" size effect. This statistic is proportional to *F*, and it translates the difference in means into a proportion of the pooled standard deviation, thereby providing a standardized method of comparison to other studies.

Gender interaction. In an interaction between target type and gender of participant, male and female students were found to differ more in their ratings of the English-type targets than of math targets, with girls invariably favoring the former over the latter (See Table 3). Although only marginally significant on acceptance score, this interaction obtained significance for 'Like to meet', 'Would be friends', and 'How fun' (questions 2, 3, and 8, respectively). Girls consistently gave more points to English-type targets, but boys were more ambivalent. They followed the female pattern for acceptance score and question 3, but rated math targets higher than those in English on questions 2 and 8.

Grade interaction. As Table 4 shows, attitudes towards math targets soured with increasing grade level on acceptance score and four of its components (popularity with same sex, normality, attractiveness, and fun personality). By contrast, acceptance scores and ratings of attractiveness and fun personality grew more positive with grade level for English-type targets. Figure 1 depicts the pattern for acceptance score. On each measure reaching significance, fifth graders distinguished least between the target types, and eleventh graders made the greatest distinction, favoring

English types.

Order effects. Female students consistently rated English-type targets appearing second more positively than any other possibility. Those girls presented with a math target first gave their second target (good in English) a mean acceptance score of 5.16; those receiving packets with the English-oriented target first gave that target a mean rating of 4.81, $F(1, 295) = 4.45$, $p < .05$. Rated least favorably by the girls were second position math targets (math second, $M = 4.35$; math first, 4.50). Similar significant patterns appeared on two other items, normality and attractiveness (data not shown). For male students, order effects were negligible.

Preference for Same-Sex Targets

On all but two measures, scores reflected a bias in favor of same-sex targets (See Table 5). Because girls had a general tendency to choose higher ratings than boys, the interaction produced a large gender difference in the mean ratings of female targets. The difference between mean scores given by boys and girls to male targets was much smaller. Compared to girls, boys differentiated more between the two target sexes.

Preference for Stereotypical Targets

Because of the same-sex bias and the strong main effect in favor of English-oriented targets, comparisons of mean ratings received by specific targets obscure the relevant characteristics of Target Type by Target Gender interactions. One cannot separate

the preference for girls good in English over those good in math from the overall preference for English-oriented targets over math targets. Likewise, the preference of boys for the male-math targets over the female-math targets could be explained by the same-sex bias and not by an adherence to stereotypes. In this section, therefore, stereotypical targets (male-math and female-English) are treated together and will be compared to the union of non-stereotypical female-math and male-English targets. This approach in effect controls for the two aforementioned tendencies, insuring that neither can be the cause of any attitude differences found toward targets on different sides of the stereotype.

Main effect. On the 'Liked by same-sex peers' item, stereotypical targets were rated higher (M = 4.86) than those who were non-stereotypical (M = 4.54), $F(1, 319) = 3.98$, $p < .05$. Cohen's d in this case is .21, a small effect size.

Gender interaction. As shown in Figure 2, boys gave non-stereotypical targets a lower mean acceptance score than stereotypical targets while girls favored the former over the latter. This pattern also occurred on the measures of attractiveness, likability, and popularity with the opposite sex (See Table 6). Although the non-stereotypical targets in each of these cases were judged quite differently by male and female students, stereotypical targets received mean ratings from males and females that were nearly equal.

Grade interaction. As shown in Table 7, eighth graders consistently awarded more favorable ratings to stereotypical

targets than to non-stereotypical targets. Students in the earlier and later grades, however, reversed this pattern on the items obtaining significance (Acceptance score, 'How nice/likeable', 'Like to meet', 'Would be friends', 'Liked by opposite sex'). Fifth and eleventh graders favored the non-stereotypical targets on each of these measures. Figure 3 shows the pattern of interaction for one of these items.

Gender and grade interaction. On question 1, 'How nice/likeable', each grade level produced a different pattern of responding by male and female students, $F(2, 319) = 4.98$, $p < .01$. Only in the fifth grade did both boys and girls give more favorable ratings to non-stereotypical targets than to stereotypical ones (difference in mean ratings by boys, 0.35; by girls, 0.50). In the later two grades, girls again favored the non-stereotypical targets (eighth grade difference, 0.21; eleventh, 2.10), but boys in these grades expressed more positive attitudes toward stereotypical targets by respective margins of 0.66 and 0.70.

Discussion

The hypothesis that children and adolescents find female peers having academic strengths and interests in mathematics less socially desirable than English-oriented females and math-oriented males was supported, particularly in certain sub-groups. Contrary to the expected trend, attitudes toward males pursuing primarily verbal academic interests were favorable. These attitudes coincided with the pervasive preference of students for English-oriented peers over those excelling in math. However, students

drew much less of a distinction between these two types of males than between the females.

Given the nature of this sample, these results may actually underestimate the prevalence and strength of stereotype-consistent attitudes among the national adolescent population. One might expect this sample, as East Coast, suburban, and upper middle class, to be less likely to encounter and perpetuate strong gender stereotypes than many other demographic groups of U.S. teens. Thus, although these results cannot be assumed to be representative of the population, they may still be a useful gauge of broader trends.

In this sample, eighth graders and males were especially prone to consider non-stereotypical females less acceptable than those conforming to the traditional academic stereotype. The curvilinear pattern of the grade effect suggests that it represents a developmental trend and not a cohort effect. Assuming this is so, the developmental progression seen here is consistent with many other findings. Early adolescence appears to be a critical period during which patterns in mathematics achievement and attitudes develop (Emmerich & Shepard, 1982; Visser, 1987). Up to this age, as studies of pre-adolescent children show, the strength of gender stereotypes increases with age (Carter & McCloskey, 1983-1984), especially, if not only, among boys (Katz & Boswell, 1986). By late adolescence, a trend towards the neutralization of math and science may begin. Such a developmental change in attitudes was observed by Emmerich and Shepard and could explain the attenuation of stereotyping among eleventh graders in the present study.

Also confirming expectations and previous research (e.g. Tocci & Engelhard, 1991) is the finding that boys are more likely to express attitudes consistent with the stereotype of math as a male domain. The previous findings most similar in this respect to the present results were reported by Emmerich and Shepard (1982), who found that preferences for peers in science and math were more strongly sex-stereotyped among boys than among girls.

Girls in the present study, as in previous studies, did not affirm that math is a male domain; indeed, in this study they even expressed attitudes seemingly contrary to the stereotype. Yet, girls clearly prefer peers, male or female, who show more interest in English. This tendency parallels their views of math and English as academic subjects. Girls' attitudes toward the students who excel in these areas become increasingly polarized as they progress through school.

The present findings may lead one to conclude that girls do not allow the traditional academic stereotypes to influence their judgements as much as boys do. However, the results may also be interpreted as showing that females invoke the stereotypes in other ways. Instead of evaluating a peer based on a consideration of the gender-appropriateness of his or her behavior, as boys seem to do, females appear to use their perception of the desirability of the behavior itself as a basis for their judgements. In the case of academic subjects, females' learned distaste for mathematics carries over to their attitudes toward the students, female and male, exhibiting strong interests and abilities in the field.

Because of the strong influence of social forces in attitude formation, especially among adolescents, such attitudes are self-perpetuating; a girl may dislike math because she perceives that no other girls in her class like it. Once started, such a cycle could continue independently, without further outside influences. However, there are outside social influences which get the cycle started and sustain it. Popular culture, parents, and teachers all contribute to this process, but male peers may hold the strongest influence. Just as boys are more likely to prefer stereotypical peers, girls are more often the people limited by the traditional academic gender roles.

Even though today's young women may consciously believe that mathematics and computers are not exclusively male domains, evidence concerning attributions and expectations clearly suggests that females do not feel as comfortable in math situations as males do. Boys have consistently expressed higher expectations of their performance than girls in math (Bornholt et al., 1994; Randhawa, 1994) and in computer use (Linn, 1985; Nelson & Cooper, 1989). Girls may also expect males to be better in mathematics. The eleventh grade females interviewed by Sherman (1983) who needed help with their mathematics homework were seven times more likely to consult their fathers than their mothers.

Cramer and Oshima (1992) observed that gifted female ninth graders used self-defeating causal attributions for their successes and failures in math. When these girls experienced success in mathematics, they, more often than boys, attributed it to effort

and good luck. Boys, on the other hand, used the internal and stable attribution of ability to explain their success. Failure was seen by girls as the result of a lack of ability or of the difficulty of the task. Notably, parents of both sexes concur with these attributions for the performance of their sons and/or daughters (Yee & Eccles, 1988).

The relative discomfort felt by females as participants in a dominantly male endeavor may cause them to respond to the study of mathematics in two important ways, among others. They may choose to take fewer and less rigorous courses in the field, and they may not try as diligently as their male peers to succeed in their math courses. Evidence for the former assertion is cited by Linn (1985), who reported that although females comprise 42% of all students taking instruction that involves computers in California, they constitute 86% of word-processing classes and only 37% of programming classes. Furthermore, only 30% of the participants of computer camps are female. Similarly, the studies reviewed by Wilder and Powell (1989) show that with age, females take fewer higher-level math courses than males. Pallas and Alexander (1983) concluded that differential course-taking could account for up to 60% of the gender gap in test scores.

As the proportion of females in such courses declines, the degree of nonconformity of those who remain increases, as does the social cost associated with nonconformity. Thus, only those females more unconcerned about their own social standing may decide to pursue their interests in mathematics and computers. If this

hypothesis is true, it may explain why such females are viewed increasingly negatively as they progress through school. Perhaps females persevering in higher math courses despite the social consequences *are* generally less socially interactive than those who may have suppressed their interests in math for the sake of social acceptance. Whether genuine personality differences between these groups exist or not, however, this account cannot explain the negative attitudes toward females at grade levels in which all must take mathematics.

If the females for whom instruction in mathematics is a requirement perceive that success in mathematics is inappropriate, they may, consciously or not, reduce their efforts in these courses. Davies (1986) has shown that the level of competence one achieves at an activity can be affected by the mere label that the activity bears. When girls and boys aged 11 to 17 completed a perceptual motor task described as "needlework", girls did better than boys; results when the same task was labeled "electronics" were completely reversed. In other words, "children's perception of gender-role appropriateness and inappropriateness can effect both self-perception of competence at a task and subsequent task performance" (Davies, 1986, p. 175).

Such weakening of performance may stem from a fear of social punishments. Preschoolers have been observed reinforcing each other for gender-appropriate behavior and punishing each other for cross-gender acts (Langlois & Downs, 1980). When fourth and sixth graders in one study were asked to imagine their reactions to a

hypothetical classmate displaying traits that they had identified as appropriate for the other sex, a majority said they would actively ignore the child or use verbal or physical abuse (Carter & McCloskey, 1983-1984). Although 87% of the elementary students in that study believed that cross-sex behavior was "not wrong", 70% would not play with a child exhibiting such behavior.

At the junior high and high school levels, students are likely to offer different levels of social acceptance rather than direct punishments and reinforcements. Because peer communication of social acceptance becomes increasingly subtle with age, the specific behavioral manifestations of gender-role attitudes are at these age levels more difficult to assess. Nevertheless, the power of an adolescent's peers to regulate the social rewards he or she obtains clearly makes them, collectively, an extremely influential factor in the student's daily choice of behavior.

This study has shown that one basis for students' judgements of the desirability of a peer is the gender-appropriateness of the academic subject favored by that student. The study did not show whether and how these attitudes are communicated to their targets, nor did it attempt to measure how influential these attitudes are on a student's academic behavior. These are questions needing further research. What this study has demonstrated is that peer attitudes are such that girls who are influenced by them would be discouraged from developing their talents in math. Peer attitudes, then, could be a powerful link between the gender-stereotyping of mathematics and the relative underachievement of girls in math.

References

Best, R. (1983). *We've all got scars*. Bloomington: Indiana University Press.

Blackman, S. (1986). The masculinity-femininity of women who study college mathematics. *Sex Roles, 15,* 33-41.

Borman, K. M. & O'Reilly, P. (1987). Learning gender roles in three urban U.S. kindergarten classrooms. *Child and Youth Services, 8,* 43-66.

Bornholt, L. J., Goodnow, J. J., & Cooney, G. H. (1994). Influences of gender stereotypes on adolescents' perceptions of their own achievement. *American Educational Research Journal, 31,* 675-692.

Carter, D. B. & McCloskey, L. A. (1983-1984). Peers and the maintenance of sex-typed behavior: The development of children's conceptions of cross-gender behavior in their peers. *Social Cognition, 2,* 294-314.

Clifton, R. A., Perry, R. P., Parsonson, K., & Hryniuk, S. (1986). Effects of ethnicity and sex on teachers' expectations of junior high school students. *Sociology of Education, 59,* 58-67.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155-159.

Cramer, J. & Oshima, T. C. (1992). Do gifted females attribute their math performance differently than other students? *Journal for the Education of the Gifted, 16,* 18-35.

Davies, D. R. (1986). Children's performance as a function of

sex-typed labels. *British Journal of Social Psychology, 25,* 173-175.

Eccles, J. E., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. K., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Perspectives on Achievement and Achievement Motivation* (pp. 75-145). San Francisco: Freeman.

Eccles, J. E., Adler, T. F., & Meece, J. L. (1984). Sex differences in achievement: a test of alternate theories. *Journal of Personality and Social Psychology, 46,* 26-43.

Ekstrom, R. B. (1994). *Gender differences in high school grades: An exploratory study* (College Board Rep. No. 94-3). New York: College Entrance Examination Board.

Emmerich, W. & Shepard, K. (1982). Development of sex-differentiated preferences during late childhood and adolescence. *Developmental Psychology, 18,* 406-417.

Friedman, L. (1989). Mathematics and the gender gap: A meta-analysis of recent studies on sex differences in mathematical tasks. *Review of Educational Research, 59,* 185-213.

Hyde, J. S., Fennema, E., & Lamon, S. J. (1990). Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin, 107,* 139-155.

Kane, M. J. (1988). The female athletic role as a status determinant within the social systems of high school adolescents. *Adolescence, 23,* 254-264.

Katz, P. A. & Boswell, S. (1986). Flexibility and traditionality in children's gender roles. *Genetic, Social, and General Psychology Monographs, 112,* 103-147.

Langlois, J. H. & Downs, A. C. (1980). Mothers, fathers, and peers as socialization agents of sex-typed play behaviors in young children. *Child Development, 51,* 1237-1247.

Linn, M. C. (1985). Gender equity in computer learning environments. *Computers and the Social Sciences, 1,* 19-27.

McTeer, J. H. (1986). Gender differences in relationship to likes and dislikes of four subject areas. *High School Journal, 69,* 260-263.

Nelson, L. J. & Cooper, J. (1989, March). *Sex role identity, attributional style, and attitudes toward computers.* Paper presented at the Eastern Psychological Association Conference, Boston.

Pallas, A. M. & Alexander, K. L. (1983). Sex differences in quantitative SAT performance: New evidence on the differential coursework hypothesis. *American Educational Research Journal, 20,* 165-182.

Randhawa, B. S. (1994). Self-efficacy in mathematics, attitudes, and achievement of boys and girls from restricted samples in two countries. *Perceptual and Motor Skills, 79,* 1011-1018.

Sadker, M. & Sadker, D. (1986). Sexism in the classroom: From grade school to graduate school. *Phi Delta Kappan, 67,* 512-515.

Sadker, M., Sadker, D., & Steindam, S. (1989). Gender equity and

educational reform. *Educational Leadership, 46(6)*, 44-47.

Sherman, J. (1983). Girls talk about mathematics and their future: A partial replication. *Psychology of Women Quarterly, 7*, 338-342.

Sosniak, L. A. & Ethington, C. A. (1988). School quality and high school seniors' attitudes toward academic coursework. *Journal of Educational Research, 82*, 113-119.

Stipek, D. J., & Gralinski, J. H. (1991). Gender differences in children's achievement-related beliefs and emotional responses to success and failure in mathematics. *Journal of Educational Psychology, 83*, 361-371.

Tocci, C. M. & Engelhard, G., Jr. (1991). Achievement, parental support, and gender differences in attitudes toward mathematics. *Journal of Educational Research, 84*, 280-286.

Visser, D. (1987). Sex differences in adolescent mathematics behavior. *South African Journal of Psychology, 17*, 137-144.

Wainer, H. & Steinberg, L. S. (1992). Sex differences in performance on the mathematics section of the Scholastic Aptitude Test: A bidirectional validity study. *Harvard Educational Review, 62*, 323-336.

Ware, M. C. & Stuck, M. F. (1985). Sex-role messages vis-a-vis microcomputer use: a look at the pictures. *Sex Roles, 13*, 205-214.

Wilder, G. Z. & Powell, K. (1989). *Sex differences in test performance: A survey of the literature* (College Board Rep. No. 89-3). New York: College Entrance Examination Board.

Yee, D. K. & Eccles, J. S. (1988). Parent perceptions and attributions for children's math achievement. *Sex Roles, 19,* 317-333.

TABLE 1: *Example of Target Description and Questions*

Jill is an eighth grader in Millersville Junior High. Her favorite subject is math, and she does best in math. She doesn't do as well in English. Her hobby is programming her computer and playing games on it. Jill wants to become a computer engineer when she grows up.

1. How nice is Jill? ["likeable" for 11th graders]
2. Would you like to meet Jill?
3. If Jill were in your school, would you be friends?
4. Do you think other girls would like Jill?
5. Would boys like her?
6. How normal is Jill?
7. How do you think Jill looks?
8. How fun or boring is Jill?

Note: Each question was followed by a seven point scale, with appropriately labelled endpoints and midpoints.

TABLE 2: *Mean Responses by Type of Target*

Measure	Math	English	$F(1, 295)$
Acceptance Score	4.39	4.78	13.6***
How nice/likeable	4.92	5.05	1.04
Like to meet	4.83	5.05	1.73
Would you be friends	4.25	4.62	6.37*
Liked by same sex	4.51	4.88	5.51*
Liked by opposite sex	3.45	4.18	22.5***
How normal	5.15	5.74	12.7***
How does he/she look	4.02	4.33	5.51*
How fun	3.98	4.35	4.92*

Note: $N = 172$ responses for each target type. N on some measures is 171.
*$p < .05$ **$p < .01$ ***$p < .001$

TABLE 3: *Mean Responses by Target Type by Participant Gender*

Measure	Math		English		$F(1, 295)$
	Boys	Girls	Boys	Girls	
Acceptance Score	4.34	4.43	4.50	5.00	3.64
How nice/likeable	4.85	4.99	4.73	5.32	3.66
Like to meet	4.87	4.80	4.68	5.35	6.00*
Would you be friends	4.23	4.27	4.27	4.91	4.50*
Liked by same sex	4.46	4.56	4.82	4.93	0.11
Liked by opposite sex	3.35	3.54	3.90	4.41	0.60
How normal	5.03	5.24	5.55	5.90	0.90
How does he/she look	3.86	4.15	4.08	4.54	0.47
How fun	4.06	3.91	3.96	4.67	6.37*
N responses	78	94	78	94	

Note: Reported F value is for the 2-way interaction.
*$p < .05$ **$p < .01$ ***$p < .001$

TABLE 4: *Mean Responses by Target Type by Grade*

Measure	Math 5th	Math 8th	Math 11th	English 5th	English 8th	English 11th	$F(2, 295)$
Acceptance Score	4.71	4.17	4.00	4.72	4.77	4.97	6.19**
How nice/likeable	5.25	4.80	4.19	5.17	5.00	4.81	1.66
Like to meet	5.20	4.51	4.67	5.01	5.03	5.24	2.96
Would you be friends	4.46	3.99	4.43	4.61	4.52	5.05	1.29
Liked by same sex	5.13	4.13	3.67	5.01	4.84	4.52	3.77*
Liked by opposite sex	3.50	3.44	3.33	3.91	4.39	4.43	1.81
How normal	5.51	4.99	4.38	5.79	5.59	6.14	3.15*
How does he/she look	4.26	3.83	3.80	4.17	4.39	4.70	3.84*
How fun	4.39	3.68	3.55	4.12	4.43	4.90	6.58**
N responses	76	75	21	76	75	21	

Note: Reported F value is for the 2-way interaction.
*$p < .05$ **$p < .01$ ***$p < .001$

TABLE 5: *Mean Responses by Target Gender by Participant Gender*

Measure	Male Targets		Female Targets		$F(1, 295)$
	Boys	Girls	Boys	Girls	
Acceptance Score	4.66	4.50	4.17	4.93	16.5***
How nice/likeable	5.03	5.01	4.55	5.30	11.0**
Like to meet	5.13	4.80	4.42	5.35	16.4***
Would you be friends	4.79	4.27	3.71	4.91	35.0***
Liked by same sex	4.59	4.68	4.69	4.81	0.06
Liked by opposite sex	3.71	3.79	3.54	4.17	1.08
How normal	5.62	5.36	4.96	5.79	6.39*
How does he/she look	4.18	4.10	3.76	4.59	8.20**
How fun	4.26	4.02	3.77	4.56	6.97**
N responses	78	94	78	94	

Note: Reported F value is for the 2-way interaction.
*$p < .05$ **$p < .01$ ***$p < .001$

TABLE 6: *Mean Responses by Stereotypical Status of Target by Participant Gender*

Measure	Stereotypical		Non-Stereotypical		$F(1, 319)$
	Boys	Girls	Boys	Girls	
Acceptance Score	4.53	4.57	4.34	4.90	7.39**
How nice/likeable	4.92	4.91	4.69	5.44	9.93**
Like to meet	4.71	4.90	4.82	5.28	1.33
Would you be friends	4.20	4.46	4.29	4.74	1.27
Liked by same sex	4.97	4.79	4.40	4.68	1.86
Liked by opposite sex	3.77	3.77	3.51	4.22	5.45*
How normal	5.32	5.42	5.27	5.76	1.69
How does he/she look	4.15	4.11	3.83	4.63	10.7**
How fun	4.20	4.16	3.88	4.45	3.75
N responses	66	102	90	86	

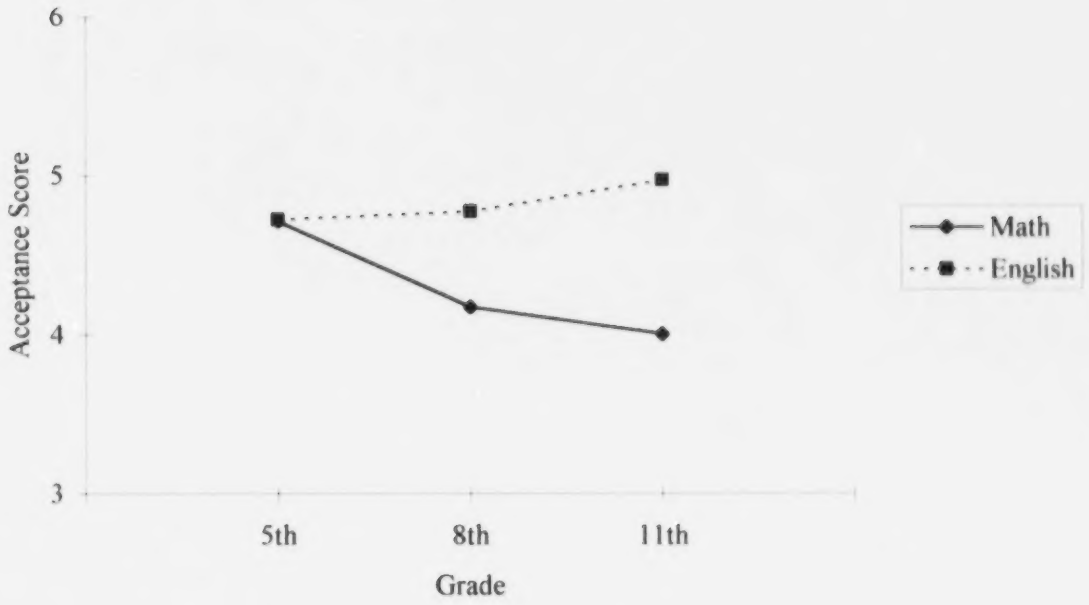
Note: Reported F value is for the 2-way interaction.
*$p < .05$ **$p < .01$ ***$p < .001$

TABLE 7: *Mean Responses by Stereotypical Status by Grade*

Measure	Stereotypical 5th	Stereotypical 8th	Stereotypical 11th	Non-stereotypical 5th	Non-stereotypical 8th	Non-stereotypical 11th	$F(2, 319)$
Acceptance Score	4.52	4.63	4.36	4.90	4.31	4.60	6.10**
How nice/likeable	5.01	4.99	4.30	5.40	4.82	4.68	4.17*
Like to meet	4.78	4.95	4.55	5.41	4.59	5.32	5.40**
Would you be friends	4.20	4.47	4.50	4.85	4.04	4.95	6.74**
Liked by same sex	5.11	4.86	3.95	5.04	4.12	4.23	2.70
Liked by opposite sex	3.46	4.12	3.65	3.94	3.71	4.09	4.28*
How normal	5.45	5.32	5.35	5.85	5.25	5.18	0.88
How does he/she look	4.01	4.19	4.30	4.41	4.03	4.20	2.47
How fun	4.15	4.16	4.30	4.36	3.95	4.15	0.86
N responses	74	74	20	78	76	22	

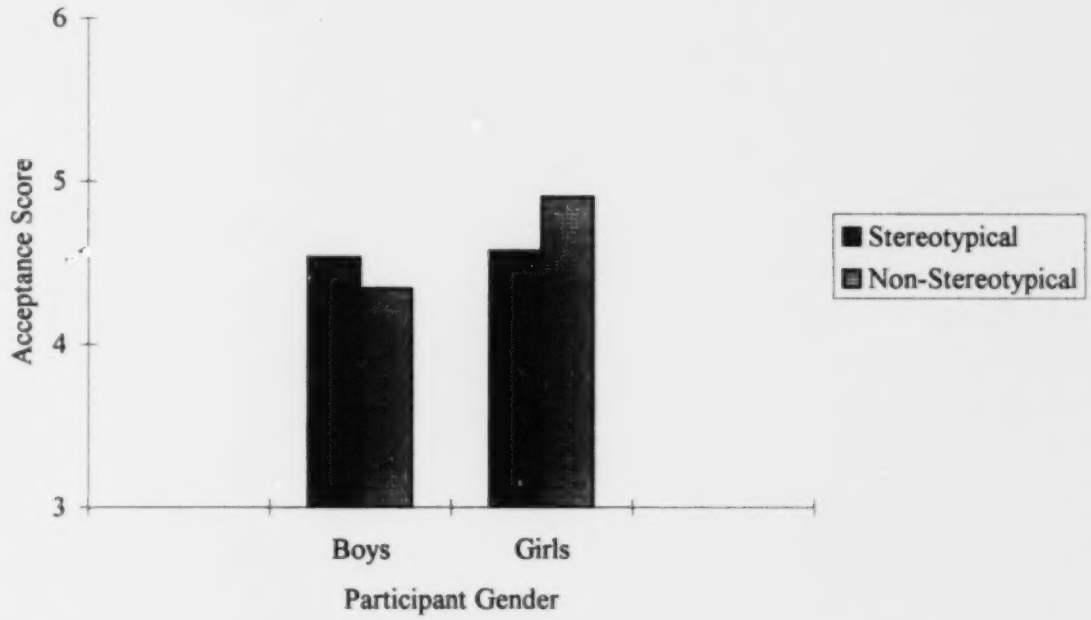
Note: Reported F value is for the 2-way interaction.
*$p < .05$ **$p < .01$ ***$p < .001$

FIGURE 1: Target Type by Grade
Mean Responses on Acceptance Score



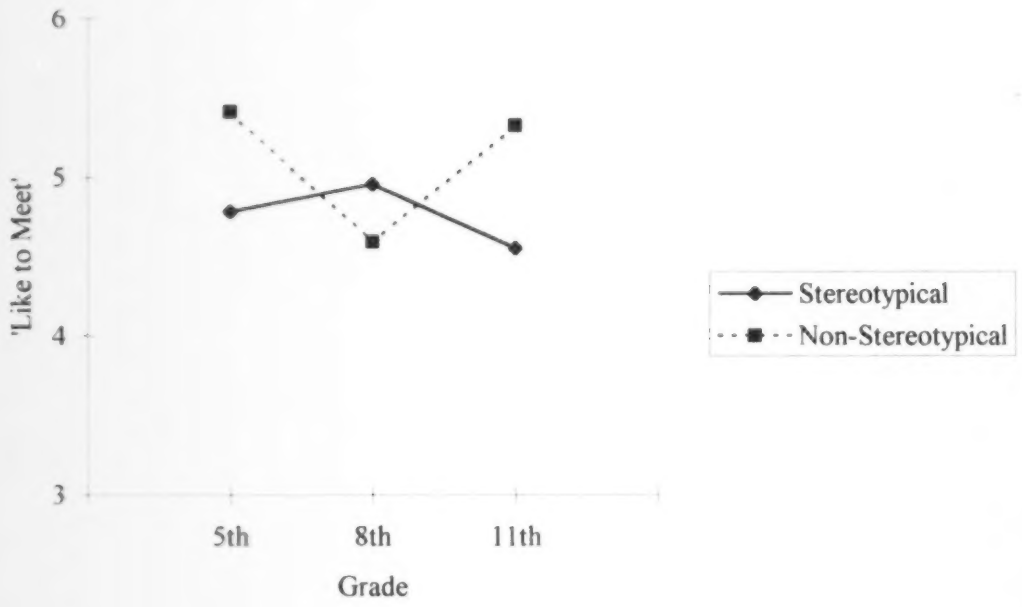
Note: $N = 172$. Interaction $F(2, 295) = 6.19$, $p < .01$.

FIGURE 2: Stereotypical Status by Participant Gender
Mean Responses on Acceptance Score



Note: $N = 172$. Interaction $F(1, 319) = 7.39$, $p < .01$.

FIGURE 3: Stereotypical Status by Grade
Mean Responses on 'Like to Meet'



Note: $N = 172$. Interaction $F(2, 319) = 5.40$, $p < .01$.